

Environmental sampling of a bell barrow on Horsell Common, Woking

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In July 2012 a slit trench was excavated on the south slope of the western of the two bell barrows on Horsell Common. This was to establish the state of preservation of the mound and obtain environmental samples from any surviving buried soil level and turves. The work was in advance of a programme to repair visible damage to the mound caused by various interventions in the past and continuing erosion from use of the footpath that crossed the monument. The trench showed that, at least in the area investigated, the mound had been disturbed on several occasions, probably initially by one or more antiquarian 'treasure hunts', later by the insertion of an iron sheet-lined Second World War foxhole/machine gun position and finally, more recently, by several small pits. Despite all this, parts of the turf stack core of the barrow remained intact and the environmental samples showed that the barrow was constructed on developed heathland and contained turves from a variety of sources.

Introduction

Horsell Common lies just over 1km north of Woking town centre and, uniquely for Surrey, is the site of one disc and two bell barrows. These form a roughly east–west line running parallel and close to what is now the Basingstoke canal (fig 1). The canal had been built more or less along the line of an earlier stream that formed a small boggy valley about 100m south of the row of barrows. These were, therefore, sited on flattish but slightly higher ground that originally overlooked a shallow stream valley. This combination of juxtaposed dry and wetland habitats is significant in terms of the variety of pollen recovered from the barrow (see pollen report below).

The group of three barrows lie on the sands of the Bagshot Beds and, at an average height of 31m OD, none occupies an obviously dominant position in the surrounding landscape. Bell barrows are generally dated to the early Bronze Age – the only other certain example in Surrey is in Deerleap Wood, Wotton and was excavated by Corcoran (1963), while Grinsell (1987, 38) lists a further two possible barrows of this type in the county.

The western of the bell barrows (fig 2) reported on here (Surrey National Monument no 20148) is located at TQ 01413 59806, with the accompanying disc barrow lying a short way to the east (figs 3 and 4). Both these barrows lie in an area of what is now typical modern Surrey heathland and are surrounded by pine trees while the easternmost barrow is, at the time of writing, covered by pine trees and has been truncated by an office car park.

All three Horsell barrows appear in Grinsell's lists and were visited by him in 1931 and again in 1971 (Grinsell 1932, 61–2; 1987, 39). The western barrow in 1971 is described as showing 'several depressions on the mound before 1931: further damage recently by treasure seekers. Slight indications of an outer bank'. The present authors surveyed both this and the disc barrow in 2009 and the results are shown as a digital terrain map (fig 3).

The bell barrow

The monument is one of five certain or possible bell barrows in the county. It has a maximum diameter of 56m and the central mound survives to a height of 1.6m. There are faint traces of a possible outer ditch on the northern side, but the first certain structural feature is the almost complete external circular bank and internal ditch that surround the berm with its central mound. This mound has been badly damaged over the years and exhibits the 'dished' summit typical of antiquarian disturbance and a slot-like depression runs radially up the southern flank, which is again thought to be the result of 19th century

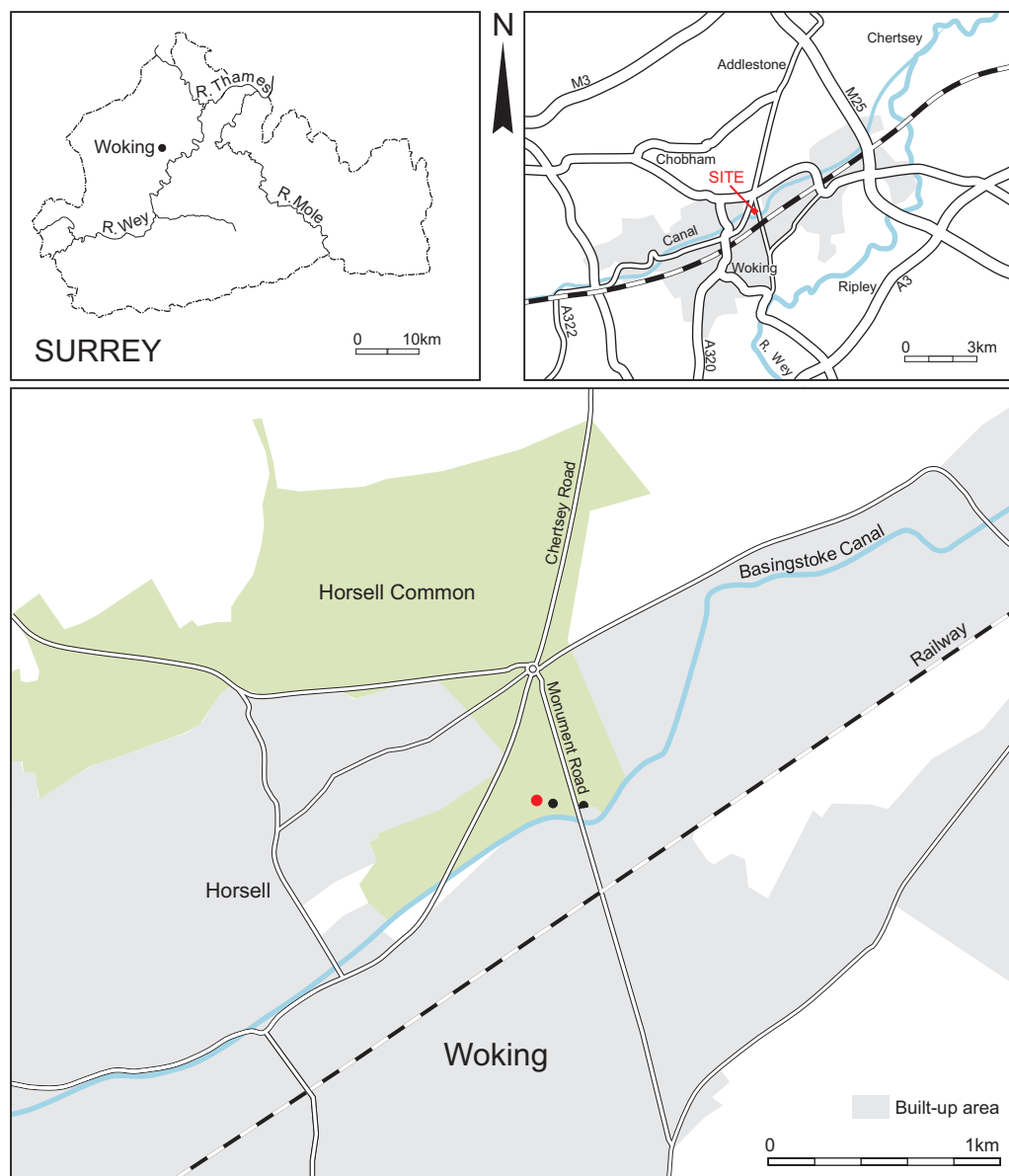


Fig 1 Horsell Common. Location of site. Western bell barrow (red circle) with disc barrow immediately to the east and second bell barrow on east side of Monument Road (black circles). (© Crown copyright Ordnance Survey. All rights reserved)

activity. In addition, there is what appears to be a military foxhole on the south-west flank and the whole mound has been subject to damage by burrowing animals. A public footpath runs across the mound from east to west and this has also cut into the monument (fig 4). All this confirms Grinsell's observations and those of a later report (Bird *et al* 1985, 127), which mentions that 'one of the bell barrows on Horsell Common [has been] illegally dug into, apparently to take core samples'.

At Horsell, as elsewhere in Surrey, increasing public pressure on the commons is causing accelerating damage to heathland barrows which, being constructed of sand, are particularly



Fig 2 Horsell Common. View of the western bell barrow looking west.

vulnerable to erosion. The Horsell Common Preservation Society, which manages the Common, decided in 2009 to take steps to protect the barrows by clearing pine trees from the area of the disc barrow and by creating a new footpath to draw people away from the barrows themselves. As part of the consent for this work, English Heritage required a topographical and partial magnetometer survey of the monuments and the immediate surroundings, which was undertaken by the authors. Subsequently, a small test excavation was carried out along part of the route of the new footpath, between the two barrows. The results were negative apart from a series of undated parallel grooves at the surface of the A horizon (Graham & Graham 2009; Howe *et al* 2011, 286, where it is referred to as Woodham Common, a sub-section of Horsell Common)

The excavation (figs 4–8)

A trench, 9 x 1.8m, was excavated radially down the south flank of the mound and was deliberately sited over what appeared to be an earlier intervention or interventions. The trench ran from just short of the centre of the monument to very slightly into the berm (figs 4 and 5). The aims were to minimise damage to any surviving stratigraphy and to avoid any central burial that might have survived the probable antiquarian shaft that appears to have been sunk into the middle of the mound.

Under the humus (100) the stratigraphy of the long west section (fig 6) consists of probable spoil thrown up in part by the antiquarian excavations and partially, further down the slope, material that has eroded from the top of the mound over the centuries (101, 103). Although these layers appeared homogenous it may be that the lower part was derived from the ditches and formed an original capping layer to the turf stack core. Beneath this, the profile shows clear evidence of the original barrow construction. The highest of these levels consists of a thick band of yellow/brown sand (104, 107, 109) that varied in consistency, but without any clear demarcation lines and therefore appears to be one deposit, albeit perhaps with later disturbance by tree roots etc. This layer overlay a mound consisting of a mix of turves and light grey sand (116).

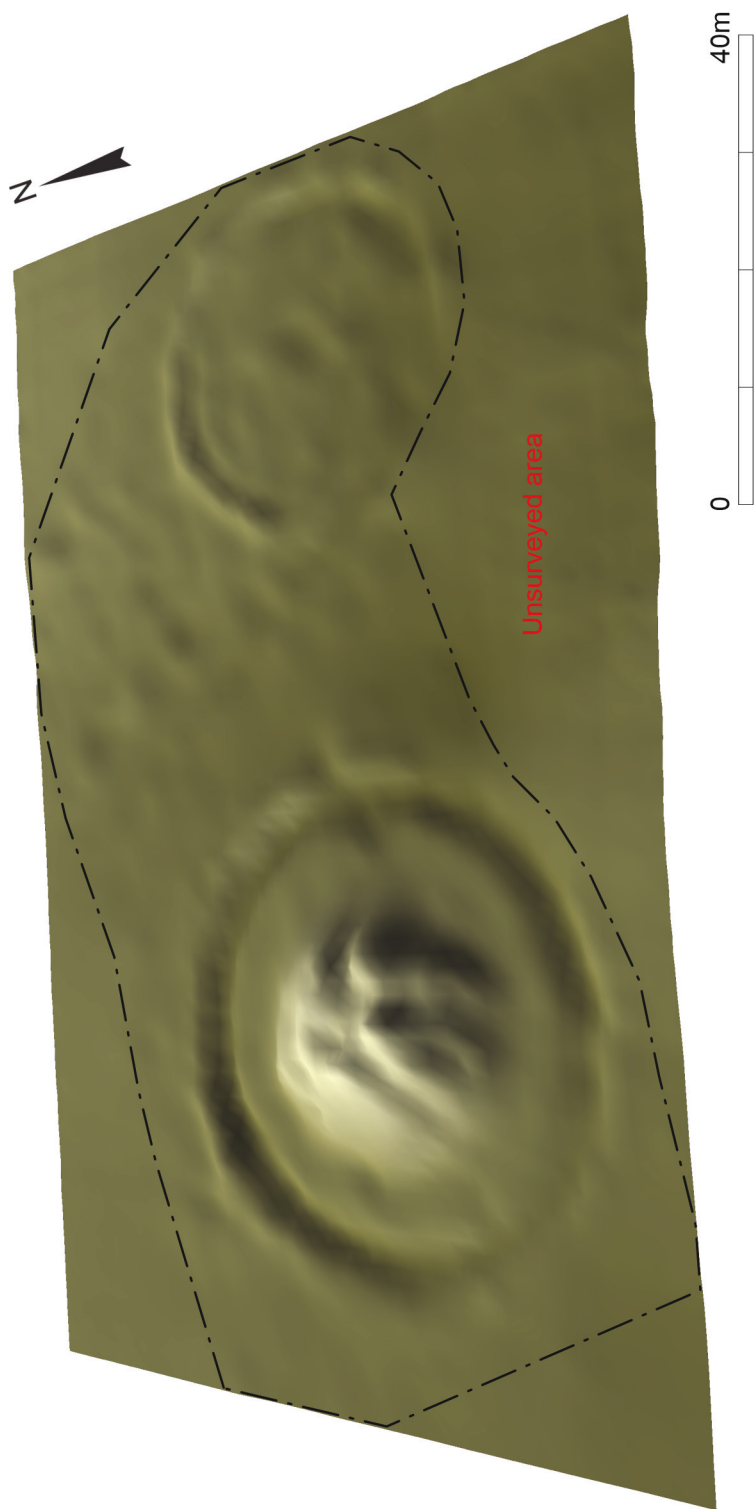


Fig 3 Horsell Common. Digital terrain map of the bell and disc barrows.

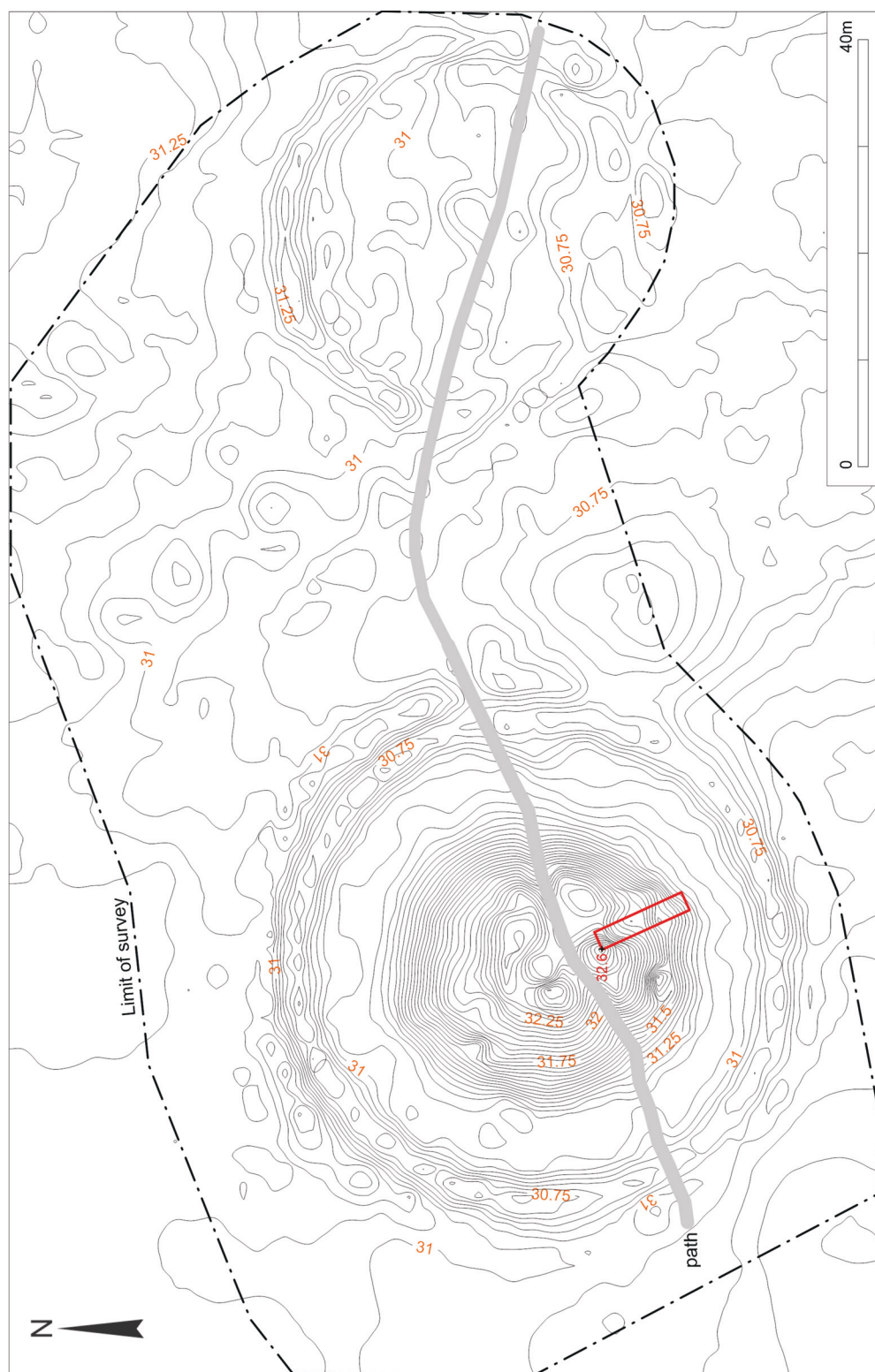


Fig 4 Horsell Common. Contour survey of bell and disc barrows showing location of 2012 trench (red) and path (grey tone). Contour heights in metres and facing uphill.

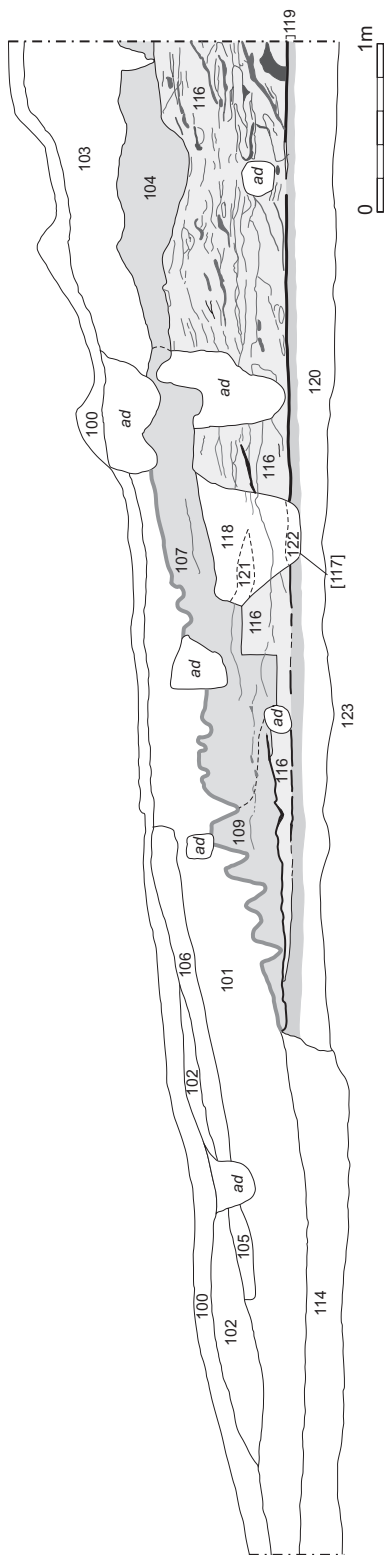


Fig. 5 Horsell Common. West (longitudinal) section; *ad* = animal damage. Grey tone (104, 107, 109 and 116) indicates possible original barrow capping.

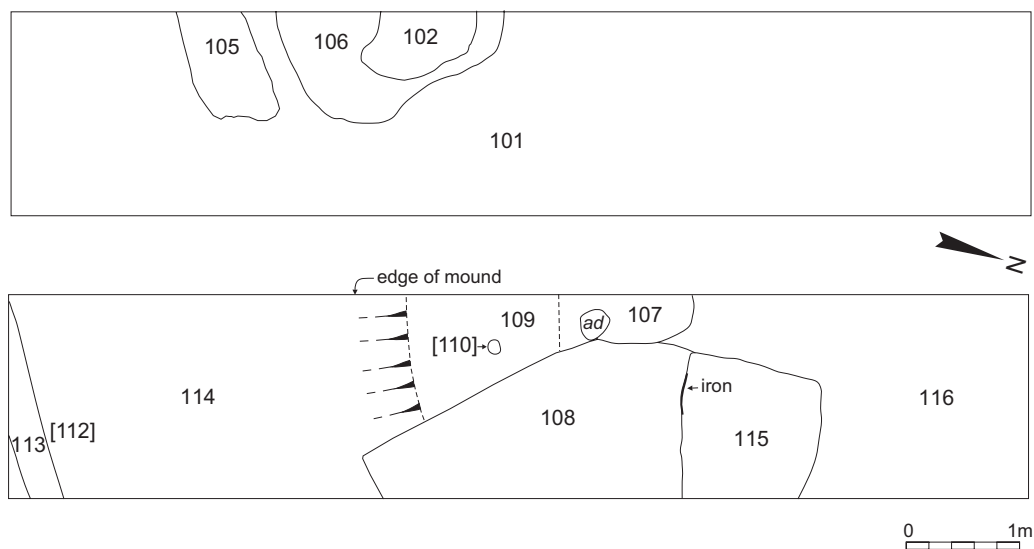


Fig 6 Horsell Common. Trench plan: (above) upper level; (below) lower level; *ad* = animal damage.

Both this (116) and the overlying yellow/brown sand (104, 107, 109) produced a few burnt flints and three crude flint flakes were also recovered from the upper levels of the turf/sand deposit (116). The latter overlay a buried soil level (119), which did not extend beyond the edge of the mound where it was cut by a deposit of light grey sand containing water-rolled pebbles (114). Again, apparently only under the mound, the soil level (119) overlay a band of clean whitish sand (120) which, in turn, was underlain by the natural yellowish sand of the Bagshot Beds (123).

The section also shows a number of areas of animal damage (fig 6: *ad*), but one deliberate cut (117) that underlies the yellow/brown sand (107) penetrates the probable turves and buried soil/turf layer (116, 119). This feature, which contained three indistinct fills (118, 121, 122), seems to belong to an intermediate phase of the barrow construction process – after the laying of the sand/turf core – but before the probable contemporary capping, or alternatively later phase, of yellow/brown sand (104, 107, 109) was put in place. The base of the cut was filled with light grey sand (122), while the rest consisted of a medium brown sand (118) within which was a band of mottled yellow sand (121). The latter appears similar to the overlying band of yellow/brown sand (107) and the cut may, therefore, be almost contemporary with that deposit. There was no sign of any burial or contents within the excavated section of the cut, so its purpose is unknown.

There were also a number of superficial cuts and fills (figs 5 and 6: 102, 105, 106) at the berm end of the trench and underlying the humus layer (100). These must be recent features, which do not affect the interpretation of the main elements of the stratigraphy. The other relatively recent feature was a large semi-circular corrugated iron-lined pit (fig 5: 108/115). This was the remains of a Second World War machine-gun post set into the barrow and sited to overlook the nearby bridge across the canal. The pit did not extend as far as the western edge of the trench and is therefore not visible in the section (fig 6).

The end section of the trench (figs 7 and 8) near the core of the mound shows the same basic sequence, although because of time restrictions, only the western 1m width of the trench was excavated to the full depth. The environmental samples were taken from this end and the column is shown on the section drawing.

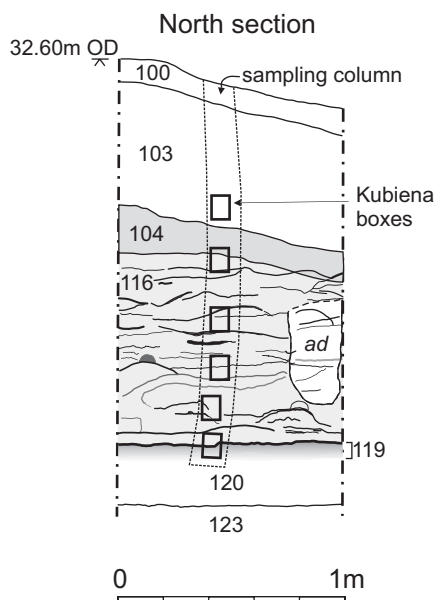


Fig 7 Horsell Common. North (end) section showing position of pollen sampling column; ad = animal damage. Pollen depth measurements start at 32.36m OD, not the ground surface.

Pollen analysis, by Nicholas P Branch and Michael Simmonds

This paper presents the results of a pollen stratigraphical analysis of an ancient soil profile and overlying turf stack at Horsell Common Bronze Age barrow. The study was conducted not only to reconstruct the local vegetation history at the time of barrow construction, but also to improve understanding of the history of vegetation succession in southern England.

METHODS

The field sampling procedures involved the collection of a continuous series of small bulk samples (1cm in thickness) from the top of the barrow mound to the base of the excavated sequence. For this preliminary study, sixteen pollen samples were selected for analysis spanning the lower 15cm of the turf stack and 7cm of the ancient soil profile (palaeosol). Pollen grains and spores were extracted following standard procedures, involving sub-sampling 4g dry weight of soil, dispersal in 1% sodium pyrophosphate, sieving through 5 μ m and 150 μ m meshes to remove fine and coarse mineral and organic matter, removal of mineral matter using sodium polytungstate (specific gravity 2g/cm³), acetolysis and mounting in glycerol jelly (Branch *et al*, 2005). Pollen grains and spores were identified using type collections and the following sources of keys and photographs: Moore *et al* (1991) and Reille (1992). Plant nomenclature follows the *Flora Europaea* as summarised in Stace (1997). A total of 300 pollen grains and spores were recorded for each sample. The results are expressed as a percentage of total pollen (fig 9) and pollen concentration (grains/g; fig 10), and presented using TILIA2 software (Grimm 1991–2011).

RESULTS AND INTERPRETATION OF THE POLLEN STRATIGRAPHY

The description of the results and interpretation has been divided into two sub-sections: first the ancient (buried) soil profile (palaeosol), and secondly the turf stack comprising layers of 'topsoil' (black layers) and 'subsoil' (white layers) (figs 9 and 10). It should be noted that



Fig 8 Horsell Common. View of north section showing location of sampling.

in places separation of 'topsoil' from 'subsoil' within the turf stack proved to be difficult, probably due to depositional and post-depositional mixing of layers.

Ancient (buried) soil (150–143cm; 30.86–30.93m OD)

The buried soil is characterised by high percentage values of shrub pollen, notably *Calluna vulgaris* (39% increasing to 62% at 144cm) and *Corylus* type (~30%), while *Quercus* (10% decreasing to 3% at 144cm) and *Alnus* (~5–10%) dominate the tree pollen taxa with *Tilia* (maximum of 5% at 146cm), *Betula* (1%) and *Ulmus* (1%). Herbaceous pollen and spore taxa include Poaceae (9% decreasing to <1% at 144cm), *Filipendula* (<1%) and *Ranunculus* type (<1%) and *Polypodium* (<1%). Pollen concentration values range from ~36,000 grains/g in the 'subsoil' (149–150cm) to ~270,000 grains/g in the 'topsoil' (143–144cm).

The high percentage values of *Calluna vulgaris* (heather or ling) within the ancient (buried) soil profile indicates that heathland was already fully established in this part of Horsell

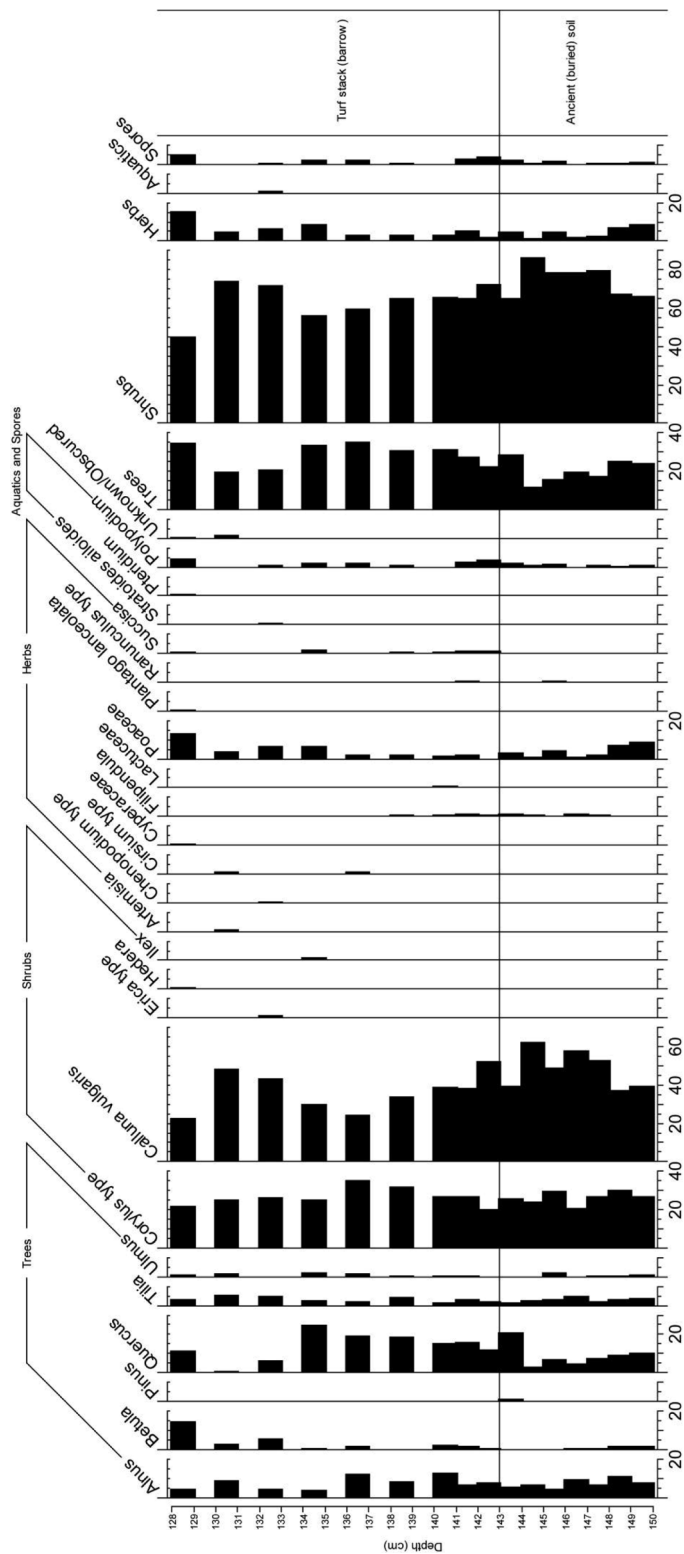


Fig 9 Horsell Common. Pollen expressed as a percentage of total pollen and presented using TILIA2 software.

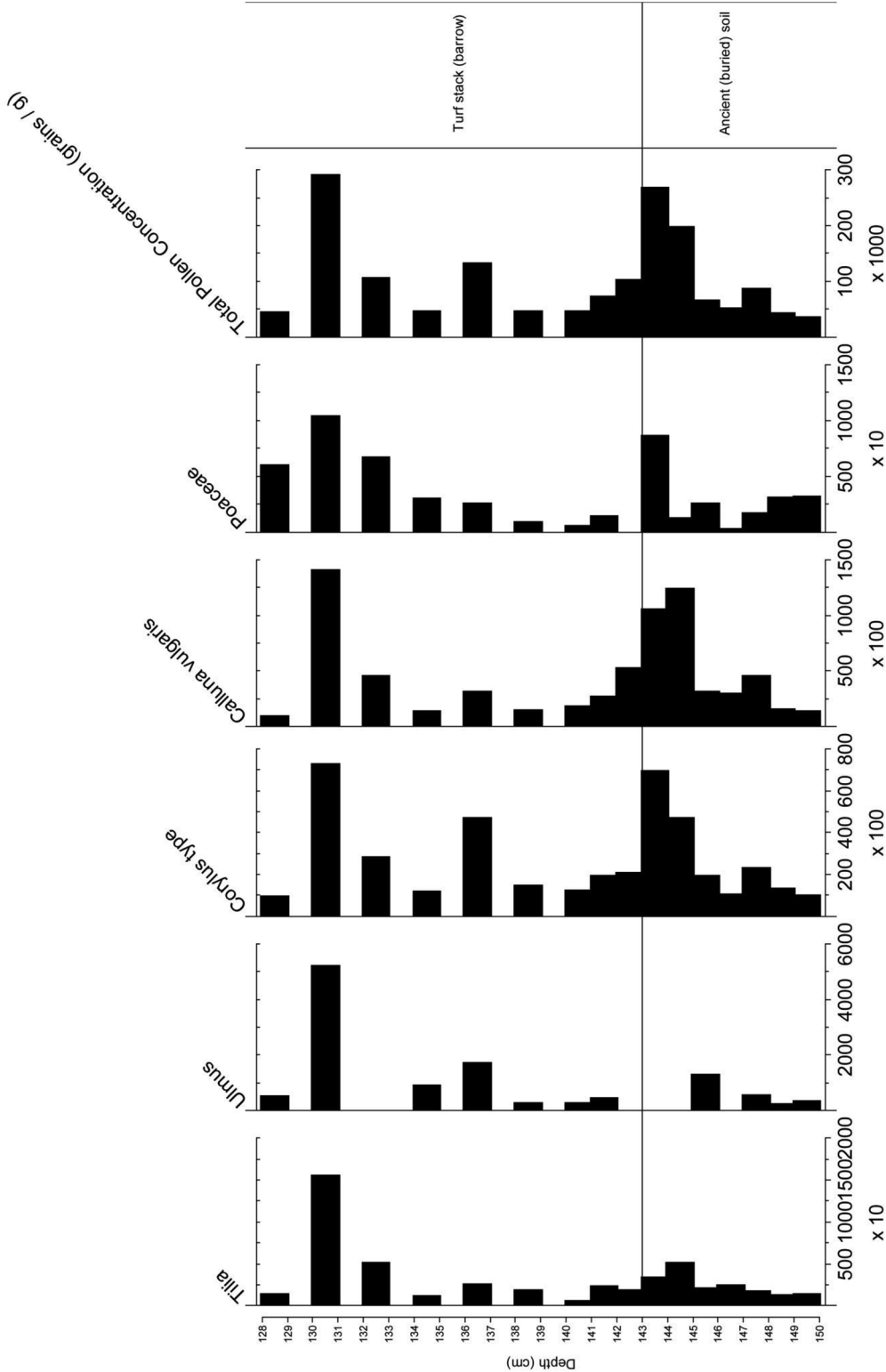


Fig 10 Horsell Common. Pollen concentration (grains/g) and presented using TILIA2 software.

Common at the time of barrow construction. *Quercus* (oak) and *Corylus* (hazel) possibly formed stands of open woodland and shrubland together with *Betula* (birch). The presence of *Alnus* (alder) together with *Filipendula* (meadowsweet) and *Polypodium* ferns (polypody) indicates nearby wetland, probably in localised low-lying areas to the south and west of the site. The occurrence of *Ulmus* (elm) and *Tilia* (lime) is surprising because these trees do not commonly grow in *Calluna*-dominated dry heathland. *Tilia* is an insect-pollinated tree (entomophilous) and therefore its dispersal is normally close to the source, which suggests that lime and possibly elm were growing nearby. Although lime can grow on a variety of soil types, including sandy substrates (Pigott 1991), it is not abundant on nutrient poor and acidic soil, such as a podzol, which is typical of dry heathlands. Alternatively, the pollen of elm and lime may pre-date the period of heathland formation and podzolisation on the local sandy Bagshot Beds. If this interpretation is correct, the pollen of these taxa, and possibly others, may represent vegetation that is broadly typical of brown earth soils and mixed deciduous woodland. Following the widespread colonisation of heather-dominated heathland and the concurrent transformation of the soil profile, mixing of pollen of both periods ('younger' and 'older') may have occurred.

The increase in pollen concentration at the top of the ancient (buried) soil profile at Horsell Common is a typical characteristic of palaeosols (Dimbleby 1985). The calculation of pollen concentration is therefore a useful means of confirming the suspected depth and presence of the former 'topsoil' ('A' horizon). Dimbleby suggested that the 'youngest' (most recent) pollen is deposited and concentrated in this top horizon, and that pollen of 'intermediate' and 'ancient' date may be found lower in the profile (*ibid.*, 4–7). This seemingly clear distinction is not apparent in the results from Horsell Common. For instance, if the *Tilia* and *Ulmus* pollen, and possibly other taxa, are indeed older than the rest of the pollen assemblage, then according to Dimbleby's model these taxa should be concentrated further down the profile. Instead, pollen is clearly concentrated in the organic-rich former 'topsoil' and progressively declines with depth. If the *Tilia* and *Ulmus* pollen does represent an older assemblage ('intermediate' or 'ancient'), the analysis indicates that mixing of pollen of different dates has occurred throughout the profile and especially in the 'topsoil'.

Turf stack (143–128cm; 30.93–31.08m OD)

The analysed section of the turf stack (lower 15cm of the barrow mound) is characterised by high percentage values of shrub pollen, notably *Calluna vulgaris* (47% at 130cm) and *Corylus* type (35% at 136cm). *Erica* type, *Hedera* and *Ilex* are present with values of 1% or less. *Quercus* (24% at 134cm) and *Alnus* (10% at 136cm) dominate the tree pollen taxa with *Betula* (14% at 128cm), *Tilia* (5% at 130cm) and *Ulmus* (1%). *Pinus* is present at 143cm. Herbaceous pollen taxa include Poaceae (13% at 128cm) with low values (1% and less) of *Artemisia*, *Chenopodium* type, *Cirsium* type, Cyperaceae, *Filipendula*, Lactuceae, *Plantago lanceolata*, *Ranunculus* type and *Succisa*. Aquatic and spore taxa include *Stratoides ailoides* (<1%), *Pteridium* (<1%) and *Polypodium* (4% at 128cm).

The hypothesis that the 'alternating' layers of dark and light coloured soil material forming the core of the barrow mound represent the localised excavation of 'topsoil' and 'subsoil' (turves) was tested by the pollen analytical results presented here. The results reveal that *Calluna vulgaris* and *Corylus* generally dominate the layers, which is consistent with data from the ancient (buried) soil. The values of *Alnus*, *Tilia* and *Ulmus* are also broadly similar, which tends to confirm the localised origin of the turf. However, there are three interesting differences that require comment: (1) the consistently higher pollen values of *Quercus* in the turves, (2) the higher values of *Betula* from 133 to 128cm, and (3) the greater diversity and abundance of herbaceous pollen taxa from 144 to 128cm. These differences could be due to natural variability in the abundance of pollen of individual taxa within the localised soil profile, differences in pollen spectra between the 'topsoil' and 'subsoil' samples, and depositional and post-depositional mixing of pollen between the 'topsoil' and 'subsoil'. All

of these aspects would give an artificial abundance and stratification, which might imply differences between the pollen content of the buried soil and turves, and may account for the higher values of *Quercus* and *Betula*. However, these differences and the presence of taxa such as *Succisa* (eg *Succisa pratensis* – devil's-bit scabious), a plant that grows on damp ground (meadows and woods) and lowland heaths today, may suggest that turves were being excavated from outside the immediate area and transported to the site. Supporting this interpretation are the pollen data from Thursley Bronze Age barrow, which also suggest collection of turves from a variety of habitats (Graham *et al* 2004, 163). Based on the pollen assemblage as a whole, therefore, it can be concluded that turves were probably cut from areas of deciduous woodland, damp woodland, dry heath, wet heath, standing water, rough grassland and disturbed ground.

As stated above, the calculation of pollen concentration is a useful means of confirming the presence of 'topsoil' because it should have a naturally higher concentration than the 'subsoil'. Therefore, based on the pollen concentration data it is apparent that the samples at 130–131 cm, and possibly 132–133 cm and 136–137 cm, were taken from 'topsoil' (or a mixture of 'topsoil' and 'subsoil') while the remainder are probably 'subsoil'. This interpretation is consistent with the results from the ancient (buried) soil profile. Owing to depositional and post-depositional mixing of layers prior to commencement of the pollen analysis, it was visually difficult to assign many of the samples to either category.

DISCUSSION

The results of the pollen stratigraphical analysis have revealed that the environment at the time of barrow construction comprised heathland dominated by *Calluna vulgaris*. This is indicated by the high pollen values of heather (consistently >25%) and is confirmed by pollen taphonomic studies (Bunting 2003; Bunting & Hjelle 2010). Similar evidence has been found on a number of sites in southern England, which supports the hypothesis that heathland was already established by the time of barrow construction during the Bronze Age (eg Graham *et al* 2004). The number of sites in southern England that provide information on the history of heathland formation is surprisingly small, although most suggest that it commenced during the Late Neolithic (eg Bennett 1983; Greig 2004; Grant *et al* 2009; Scaife 2001; see also comment in the concluding Discussion, below). The variation in timing of the transition across the region, combined with evidence for barrow construction and settlement, and managed burning and animal husbandry, has led to the suggestion that human activities were the primary cause.

The presence of oak woodland and hazel shrubland at Horsell Common indicates that mixed deciduous woodland was also present in the heathland landscape. This interpretation is compatible with pollen studies from mires in southern England, which suggest the continuation of *Quercus* and *Corylus* during the period of heathland expansion despite a significant decline in other taxa, such as *Tilia* (Grant *et al* 2011; Groves *et al* 2012). However, oak and hazel often have significantly depleted pollen values by comparison with the Early Holocene. The almost complete absence of *Pinus* woodland at Horsell Common is not surprising and is consistent with other Middle Holocene pollen records from southern England (eg Grant *et al* 2009; Grant & Waller 2010; Groves *et al* 2012).

The presence of *Tilia* in the pollen record is particularly interesting and, as stated above, it is unclear whether this taxon was growing at Horsell Common at the time of barrow construction and formed a component of the deciduous woodland cover within the wider landscape, or pre-dated the construction and represents a former vegetation community. Pollen records from the mires at Hurston Warren and Conford (Hampshire) support the possibility that the *Tilia* pollen represents a remnant of the former vegetation cover, which has subsequently become mixed with later ('younger') pollen taxa. These sites clearly highlight the importance of *Tilia* prior to the expansion of heathland (Groves *et al* 2012). This interpretation is inconsistent with that proposed by Wiltshire (2004) for Thursley Common

Bronze Age barrow, where it was concluded that lime was growing in the catchment on mesotrophic soils, and was contemporaneous with the formation of heathland. This is highly unlikely given the taphonomic characteristics of *Tilia* pollen, the known ecology of lime woodland, and our understanding of vegetation history and soil formation processes during the Holocene in southern England.

POLLEN ANALYSIS CONCLUSION

The pollen stratigraphical analysis of the ancient (buried) soil and turf stack at Horsell Common Bronze Age barrow has revealed that at the time of barrow construction the local vegetation cover comprised *Calluna*-dominated heathland. *Quercus* and *Betula* probably formed open deciduous woodland together with *Corylus* shrubland. The presence of *Tilia* and *Ulmus* pollen is interesting; we have argued that this represents a pollen assemblage that was not contemporaneous with heathland formation and has subsequently been mixed with 'younger' taxa during soil formation/transformation processes, ie podsolization. Pollen analysis of the turf stack has revealed that although the assemblage is broadly consistent with ancient soil profile there are notable differences that may be explained by the collection of turves from a range of habitats.

Concluding discussion

While the barrow has suffered considerable damage over the years and has lost much of its original height, nevertheless parts of the core remain intact. The fact that the mound itself is underlain by a band of clean white sand may be significant. Similar deposits elsewhere have been noted (eg Graham *et al* 2004, fig 3) and it has been suggested that the sand was deliberately imported as part of the ritual connected with the construction of the barrow. If that is the case, the buried soil level must have been relaid, as again may have happened elsewhere. It is particularly interesting to note that a similar practice of depositing white material under monuments, albeit with different materials, has been suggested at Staines Road Farm, Shepperton (Jones 2008, 74–5) with further examples cited from other parts of the country. Alternatively, at Horsell, the white sand may be a natural deposit as white sand does occur in the general area.

Whatever the case, this was followed by the construction of a mound of turves deposited in a matrix of light grey sand. The turves appear to have come from a variety of sources (see Branch and Simmonds, above); a similar phenomenon was noted in the results of the Thursley Common barrow excavation (Wiltshire 2004, 163) and this may reflect a symbolic act commemorating the territory controlled by those buried. The mound had then been cut by a pit, possibly for a secondary burial, which might not have survived in the acidic soil. The core to the mound was then covered, either at the time or after an unknown period, by a layer of yellowish/brown sand. This in turn was covered by a layer of light grey sand, some of which has eroded from the top of the mound and, in part, also presumably been redeposited by the antiquarian work. The barrow, therefore, still retains the main elements of its construction phase, or phases, despite the later disturbance. In particular, the slot from which the pollen samples were taken seems to show that the turves are better preserved further towards the centre of the mound (fig 8).

The pollen results are interesting as they indicate that the heathland was already established by the time the barrow was constructed. There are other similar examples known elsewhere in southern Britain and it even appears to be the norm in the Low Countries (Bourgeois 2013, 181). The implication is that, at least in some cases, anthropogenic activity was already affecting the environment by the end of the Neolithic, as appears to be the case at Horsell Common and has been suggested elsewhere in Surrey by Ellaby (1987, 58) Field and Cotton (1987, 73–4) and Poulton (2004, 54).

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